Hashemite University
College of Engineering
Department of Mechatronics
Modeling and Simulation 110405311
(3 Credit Hours)

Instructor	
Name	Dr. Mohammad Al Qaderi
Email:	Mohammadk_al@hu.edu.jo
Office:	
Office hours:	Will be assigned in class

Grading info	
Mid-Term	40
Project	20
Final	40

Class Info	
Days	**Mon,Wed**
Time	9:30-11:00
Location	Online

Course

Course Number:	**110405311**
Prerequisite:	(409201) or (405211)
Textbook:	Clarence W. de Silva "Mechatronics: An Integrated Approach"1st Edition, ,CRC Press, 2004.
Course Description (as in the catalog):	This course aims to provide students with the principles and applications of modeling and simulation of multi-domain engineering systems at a level of detail suitable for design and control system implementation. Unified methods for modeling and simulating mechatronics systems with emphasis on mixed component systems containing electrical, mechanical, thermal and fluid elements; modeling of mixed physical systems by lumped-parameter linear elements, energy methods, linear graphs, bond graphs, system analogies, analytical and numerical solutions, time response, dynamic response specifications, stability considerations, case studies of mechatronics systems .
Specific Outcomes of Instruction (Course Outcomes):	By the end of this course students should be able to: 1. Analyze different various mechanical and electrical method using energy method. (Outcome a and e) 2. Analyze different systems using newton's second law, Kirchhoff's law, first law or thermodynamics laws, and etc. (Outcome a and e) 3. Able to define analogous model. (Outcome e and c) 4. Use simulation program to solve, test and design various systems. (outcome c, g, i and k)
References	1. Nicolate Lobotiu "System Dynamics for Engineering Students: Concepts and Applications," 1st Ed., Academic Press, 2010. 2. Brown, Forbes T. Engineering System Dynamics. New York, NY: CRC, 2001. 3. Ira Cochin and William Cadwallender, Analysis and Design of Dynamic Systems, Third Edition, Addison-Wesley Educational Publishers Inc., 1997.

Major Topics Covered and Schedule in Weeks:

Topic	# Weeks	# Contact hours
1. Introduction to system Modeling	1	3
2. mathematical Modeling of Mechanical Systems	2	6
3. Mathematical Modeling of Electrical Systems	2	6
6- Analogous System Representation	2	6
5- State-Space Representation	2	6
7-Linearization of Nonlinear Systems	2	6
8- mathematical Modeling of Fluid Systems	1	3
9- Mathematical Modeling of Thermal Systems	1	3
10-Mathematical Modeling of coupled-field systems.	1	3
9- Course Project discussion	1	3
Total	**15**	**45**

Course Policy:

- Attendance is mandatory.
- Respect.
- Discussion is expected.
- Engagement is expected.
- Understand, Analyze, and question?
- Cheating and copying is NOT tolerated.
- Microsoft teams

All exams will be performed on those date: Mid-term exam:
Final exam: Announced by registrar

Student Outcomes (SO) Addressed by the Course:

#	*Outcome Description*	*Contribution*
(a)	an ability to apply knowledge of mathematics, science, and engineering	***H***
(b)	an ability to design and conduct experiments, as well as to analyze and interpret data	
(c)	an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability	***L***
(d)	an ability to function on multidisciplinary teams	
(e)	an ability to identify, formulate, and solve engineering problems	***H***
(f)	an understanding of professional and ethical responsibility	
(g)	an ability to communicate effectively	***L***
(h)	the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context	
(i)	a recognition of the need for, and an ability to engage in life-long learning	***L***
(j)	a knowledge of contemporary issues	
(k)	an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice	***L***

H=High, **M**= Medium, **L**=Low